Cold Survivable Distributed Motor Controller (CSDMC)

Completed Technology Project (2016 - 2018)

Project Introduction

Landed payload mass of ocean world missions typically requires a spacecraft launch mass of 7-10x the landed mass due to the required propellant to get the payload to the surface. We will decrease this landed mass by developing a distributed electronics architecture, which places control and power electronics near or at actuators and instruments. The outcome of this effort will result in a 10X reduction in harness mass, enabling a significant increase in science payload which then enables more capable sample acquisition, delivery and analysis systems on these missions. Placing the control and power conversion electronics at or near the actuators or instruments is the cornerstone of our proposed distributed architecture. To do this, we will develop the technology necessary to distribute the electronics and place them on a shared interface and power bus. This enables a significant reduction in cable mass along with a reduction in complexity. It also allows spacecraft designers to take advantage of volume at the extremities that would normally not be utilized. The challenge to meeting the goals of our distributed architecture is reducing the Space, Weight, and Power (SWaP) of the distributed electronics and adapting them to meet the requirements to survive the extreme temperature and radiation at the exposed extremities. We will meet these requirements by combining JPL's expertise in cold capable electronics, packaging and power conversion together with the state-of-the-art high density interconnect technology. This combination will result in a unique high density technology that extends the life of landed missions and also allows the missions to do more science through the mass and volume that is made available. At the end of the proposed effort we will have demonstrated components necessary for the distributed architecture and a system design that integrates the required technologies to achieve landed mass reductions in support of ocean world missions.

Anticipated Benefits

We are providing the key technologies for a distributed motor control system for future missions to icy worlds such as Europa Lander. This technology will reduce the mass of actuator controllers and associated cabling resulting in a more capable sample acquisition, delivery and analysis systems for these missions.

Cold Survivable Distributed Motor Controller (CSDMC)

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

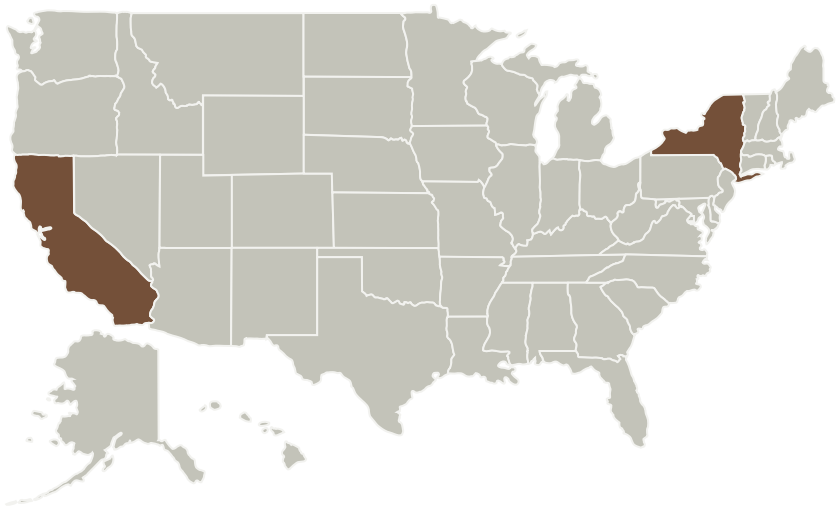
Responsible Program:

Concepts for Ocean Worlds Life Detection Technology

Cold Survivable Distributed Motor Controller (CSDMC)

Completed Technology Project (2016 - 2018)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
California Institute of Technology(CalTech)	Supporting Organization	Academia	Pasadena, California

Primary U.S. Work Locations	
California	New York

Project Management

Program Director:
Carolyn R Mercer

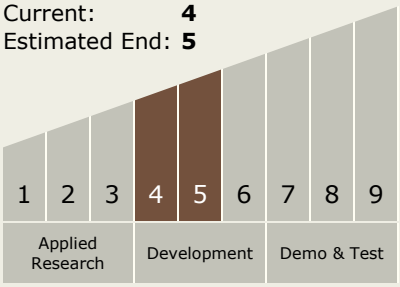
Program Manager:
Carolyn R Mercer

Principal Investigator:
Gary S Bolotin

Co-Investigators:
Douglas J Sheldon
Don J Hunter
Gregory S Cardell
Karen R Piggee
Amanda A Bowling

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.3 Manipulation
    - TX04.3.1 Dexterous Manipulation

Cold Survivable Distributed Motor Controller (CSDMC)

Completed Technology Project (2016 - 2018)

Target Destination

Others Inside the Solar System